THURSDAY, OCTOBER 16, 1919.

THE BANTU LANGUAGES.

A Comparative Study of the Bantu and Semi-Bantu Languages. Sir Harry H. Johnston. Pp. xi+815. (Oxford: At the Clarendon Press, 1919.) Price 3 guineas net.

THE comparatively small number of people in this country who care in the slightest degree about the Bantu languages must long have been aware that this volume was in preparation, and have regretted scarcely less keenly than the author himself the innumerable difficulties which have conspired to keep it from the public. It is to be hoped that the obstacles to the production of the second volume will speedily disappear, as without it a right estimate of the whole work is impossible. It is to contain "an analysis and comparison of the phonology and word-roots, and a comparative examination of the syntax of the Bantu and semi-Bantu languages," and until these are available we shall be compelled to suspend our judgment on many important points.

Even a cursory survey of the first volume, however, fills one with astonishment (when one remembers the author's multifarious activities in other directions) at the amount of patient labour involved in the compilation and arrangement of the 274 vocabularies and the tabulation of prefixes and concords following each group. The three preliminary chapters likewise represent an amount of research out of all proportion to their length, and should be studied by all who wish to become acquainted with Bantu comparative grammar; while even those who want to acquire only some particular Bantu language will find their horizons enlarged and their grammatical path smoothed. That these pages contain some highly controversial—and controverted—propositions does not lessen their value. Bantu studies advance, as did the scholastic learning (no further parallel is intended) by means of continual disputations.

Perhaps the most important of such questions concerns the difference between the prefixes and pronouns, which, though in some cases identical, in others diverge so considerably (*e.g. m-* and *yu-* or *a-*, *omu-* and *gu-*) as to make the term "alliterative concord" largely a misnomer. Connected with this is the phenomenon of the initial vowel, or article, which Sir Harry Johnston prefers to call the "preprefix." This, he thinks, has given rise to the pronoun, therein agreeing with Meinhof, but—so far as we can make out—with this difference: Meinhof holds that the prefixes, probably excepting the tenth, consisted of one syllable only—*mu-*, *mi-*, *li-*, *ma-*, etc. To these was prefixed a demonstrative particle of the hypothetical form *ya*, which, through vowel-assimilation and modification or dropping of the consonant, produced in time such forms as *gumu-*, *kumu-*, *umu-*, *gimi-*, *imi-*, *gama-*, *ama-*, etc. (In some cases the consonant, as well as the vowel, was assimilated, giving such forms as *baba-ndu*, *bibi-ndu*, etc.) This "article," or "preprefix," became the pronoun prefixed to the verb.

Sir Harry Johnston's view seems to differ from the above in assuming that the original prefix consisted of two syllables, of which the first afterwards became the subject-pronoun, while the second supplied the object—thus explaining the difference between these in the cases where it exists. But, taking into consideration such a sentence as this, from his *Encyclopædia Britannica* article, "It is possible that some of these prefixes resulted from the combination of a demonstrative pronoun with a prefix indicating quality or number," it is really difficult to distinguish his explanation from Meinhof's.

We must leave to phonetic experts the discussion of the passages with which their science is more immediately concerned—viz. pp. 36–41 and 44; they will probably dissent from some of the author's statements. Even the lay mind is inclined to doubt whether *u* in "but" is the short sound of *a* in "father"; whether the German "ich-Laut" is "almost English *sh*"; and whether the Polish velar *l* ( ) can properly be described as dental. By the "indeterminate labial" (p. 39), bilabial *f* and its corresponding voiced sounds are probably meant—and these can scarcely be said to result from "indecision on the part of the individual speaker or the tribe as to the utterance of *b* or *w*." Or are we to suppose that the whole Spanish nation halts between two opinions as to the *v* in *huevo* and that in *viejo*? But Sir Harry Johnston has seemed to us, of late, to exaggerate his revolt against pedantry into a too indiscriminate contempt for recent developments of phonetic science, and to fall back on "individual vagaries" or carelessness of pronunciation, somewhat as Socrates accused Anaxagoras of falling back on the *νοῦς*. At the same time, he credits "certain German philologists" with the theory "that we should attribute to the old Bantu some degree of vagueness in consonantal utterance." It is difficult to discover this theory in Meinhof's simple statement that primitive Bantu probably had three stops, all voiceless (*k*, *t*, *p*), and three fricatives, all voiced, *γ*, *l*, *v*. All analogy makes it probable that *γ*, for instance (which still exists in Shambala, where other languages have *g*, *j*, *dz*, *z*, or *y*), should be "the parent of the modern *g*" and some other sounds, but what vagueness of utterance is implied here, more than in any other sound-shifting that could be mentioned? (Meinhof, by the by, nowhere claims *χ*, or in Sir Harry's notation *x*, as "the parent of *k*," though he gives an example of the reverse relation.)

The paragraphs on p. 41 dealing with stress and pitch require some notice. Leaving aside the somewhat confused terminology ("accent *or pitch* of the voice"), we think the statement that the penultimate stress is the "prevailing rule in Bantu" requires some qualification. In Yao and Luganda the accent is on the stem-syllable, not shifting forward when terminations are added (*e.g. wángula*, not *wangúla*). The same seems

to be the case in Konde and Sango. Again, it is not quite accurate to say that "the use of the high and low tones of the voices for purposes of etymological distinction is not common in Bantu, and is only observable (perhaps) in the Becuana group, and most markedly in the Pañwe languages of the north-west Bantu area." Tones are exceedingly important in Shambala, as Archdeacon Woodward discovered, once they had been pointed out to him; also probably in Konde and Sango; and they certainly exist (no doubt to a greater degree than has yet been observed) in Zulu and Nyanja, to name no others.

The summary, "History of Research into the Bantu Languages," given in chap. i., is exceedingly valuable, and the generous appreciation of work done by predecessors and contemporaries renders it very pleasant reading.

OUR LEGACY OF HOPE.

The Century of Hope. A Sketch of Western Progress from 1815 to the Great War. By F. S. Marvin. Pp. vi+352. (Oxford: At the Clarendon Press, 1919.) Price 6*s.* net.

THIS is a historical sketch of the last hundred years, distinctive in its insight and grip and in the place it gives to the development of science and its reactions. The new birth of humanity at the Revolution brought with it a legacy which has been especially expressed in the growth of knowledge and in the growth of freedom. These have had manifold social reactions, as in the political revival of 1815–30, with its increased realisation of the principles of freedom in both domestic and foreign affairs; the socialistic agitation which led on the Revolution of 1848; the practical applications of science, from railways and the telegraph onwards; the diffusion of biological and evolutionist ideas; the demand for schools for all; the increased liberation of religious activity; and the adoption of social reform as a primary objective of government. These are some of the subjects with which Mr. Marvin deals in his vivid and convincing book, and he leads us in conclusion to the international progress which is promised, he thinks, even in the decade of the greatest of wars. "If the war was the greatest, so also was the world-alliance for humanity and international law which brought it to a victorious conclusion. So also, we believe, will the world-union be the greatest, and most permanent, which will arise from the devastated earth and the saddened but determined spirits who are now facing the future with a new sense of hope, which enshrines our sorrows and has overcome our most oppressive fears." Belief in the desirability and practicability of any development is certainly a factor making for its realisation, and "The Century of Hope" shows that this faith is reasonable.

The fine chapter on mechanical science and invention enforces many useful lessons. "The sciences have, broadly speaking, become applicable to useful ends in proportion to the degree in which they have become exact." "Practical applications of science have become more and more abundant in proportion to the mutual aid of the sciences among themselves." The steam-engine "was the fruit of abstract thought applied to practice, and, in its turn, paid back its debt to science by leading to the greatest and most fruitful generalisation which had yet been reached. This was the principle of the conservation of energy, arrived at in 1848." "Society has become, in all these countries where industry has been organised and developed by science, a far more united and stable thing than it was before, or than it is in other regions less advanced in this respect." These sentences illustrate the insight and grip that mark the book. In a few pages Mr. Marvin sketches the development of the evolution-idea from Goethe and Lamarck to Darwin. "The organism in all its parts and with all its instincts was for the first time seen fully as an historical being." "No other part of science, no other episode in the story which we have to trace, affected so powerfully as did the theory of evolution the development of the historical spirit which we distinguished at starting as one of the characteristics of the age. The body of a man is like every social institution, history incarnate, and to Darwin more than to any other the world owes its overwhelming bent for the historical point of view, the desire to know the origins of things, the conviction that it is only by studying their steps that we can arrive at a true comprehension of their nature."

We cannot do more than refer to the lucid chapter on the new knowledge which centres around the discovery of radio-activity, and the inspiring discussion on social and international progress. The book begins and ends with emphasis on the truth that "not economic conditions nor geography nor the ambition of governments is the *primum mobile* in human affairs, but the spirit of man itself seeking greater freedom and expansion." "The spiritual forces are the supreme factors, both in building the individual soul and in giving a common soul to all humanity." "In the history of science and its applications we have the most perfect example of a growing human product in which the diverse races of mankind have all taken a proportionate share as they advanced in civilisation." This is a book that everyone should read, for it shows that from the real world with all its "Hearts of Darkness" we may not unreasonably augur the rising of a Heart of Light.

OUR BOOKSHELF.

Australia: Problems and Prospects. By the Hon. Sir C. G. Wade, K.C. Pp. 111. (Oxford: At the Clarendon Press, 1919.) Price 4*s.* net.

SIR CHARLES WADE, Agent-General for New South Wales, was Premier of that State during three years especially eventful in the effort to establish State control of wages and industrial unions. His pessimism as to the future of that policy and of the trend of government in this country may be due to the insuperable difficulties

he then encountered. The book is based on a series of lectures on the resources and on the industrial and political problems of Australia. The author writes on political questions with expert knowledge. The chapter on the resources of Australia is less trustworthy; thus it says that there is little evidence of a diminishing flow from the artesian wells, in spite of the conclusive evidence to the contrary on the maps of the Queensland Water Supply Department. The exaggerated expectations based on the artesian water near Lake Eyre are also based on incomplete information.

The chapter entitled "Industrial and Social Problems" is probably the most important; it, however, deals only with the attempt to settle some of them by legislation. The author represents the New Zealand attempt to regulate wages by a special law court as a complete failure. He commends the wages boards of Victoria, but considers that system inapplicable where labour is aggressive. The attempt of New South Wales to enforce its labour laws by imprisonment or other penalties he regards as hopelessly impracticable. He shows, on the other hand, that the Australian system of land settlement has been remarkably successful, and the State expenditure on railways and public works a profitable investment. He predicts that the Constitution will be greatly modified in 1921, but does not expect that Australia will accept unification.

The book is a very valuable, up-to-date summary of the trend of industrial legislation in Australia, though the war has so disturbed its development that the conditions now are abnormal. A weighty preface by Sir Charles Lucas refers to the difficulties in the British and Australian comprehension of each other's points of view, and welcomes the book as helpful to that fuller knowledge and closer sympathy which are indispensable for permanent Imperial union.

Resources and Industries of the United States. By Prof. E. F. Fisher. Pp. ix+246. (Boston and London: Ginn and Co., 1919.) Price 3*s.* 9*d.* net.

PROF. FISHER'S book is illuminating in that it presents the United States to the reader in such guise as to emphasise the greatness of the progress and the healthiness of the growth of the country. It is addressed to American secondary-school pupils, but merits a much wider public; it is knit together by a doctrine which is new to geography books — the doctrine that human energies should be conserved. The pupils are stimulated to visualise not only the resources and industries, but also the means whereby these may be conserved and made of most use to the community. For example, the United States, which produces two-thirds of the world's petroleum, uses more than it produces because it wastes half the oil that comes from the earth by allowing it to run to waste or to evaporate in open storage tanks. Petroleum is needlessly used to drive engines over 32,000 miles of railroad where electricity could be utilised. The pictures and maps are effective.

LETTERS TO THE EDITOR.

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Colloid and Saline in Shock and Cholera.

THE two letters by Sir Leonard Rogers and Prof. Bayliss in NATURE of September 25 are of interest and importance, not only to physiologists and physicians, but also to physical chemists. The two series of observations are not contradictory of each other, but complementary.

There exists in blood plasma and in all living cells a delicate labile balance between the salines or crystalloids and the colloids. These two types of dissolved substances are not present in free condition, but in colloidal adsorption, the one with the other, forming a crystallo-colloidal complex.

This delicate balance is upset in opposite directions in wound-shock and in cholera respectively, saline being in excess relatively to the colloid in the former, and colloid of toxic origin in excess in the latter.

Hypertonic saline is efficacious in cholera because it replaces a defect, and combines with colloids of cells and with toxins which otherwise would combine with each other. In addition, it confers osmotic pressure on the poisonous toxins and hastens them out through the excretory cells. It is, indeed, because of this latter action that its concentration has become subnormal during the attack of cholera.

A colloid like gum-acacia is of no service in cholera, but rather the reverse, because it is an additional claimant for the denuded salines.

On the other hand, after hæmorrhage, as in wound-shock, both colloid and crystalloid are at first diluted, but saline is more fully restored from tissues than the protein colloids. In such circumstances there is no colloid available to hold any hypertonic or isotonic saline which may be injected, and this saline is promptly ejected by the excretory mechanisms; so saline alone is not efficacious. But a colloid of such a type as protein, gelatine, or gum-acacia possesses too great a molecule (or solution aggregate) to be excreted until it is broken down by metabolism, and, in addition to not being able to go out, it anchors salines by passing into labile adsorption with them, and so holds fluid in the vessels, raises pressure, assists the heart by giving fluid to fill it, and saves the cells from denudation of their crystalloids, which beyond a certain point always leads to change in colloidal aggregation and death.

It may be pointed out that such crystallo-colloidal adsorption is likewise the explanation of the important discovery of Ch. Richet, Brodin, and Saint-Girons at Paris that anaphylactic shock can be completely prevented by hypertonic saline. Here also lies the explanation for the prevention of hæmolysis by an active hæmolysin in presence of hypertonic saline as shown some years ago by McCay and Sutherland.

The saline locks up by adsorption the toxin or the immune body, and this can then no longer attack nerve-cells or blood corpuscles.

Under physiological conditions it is this adsorption of saline by colloid which determines the concentration of saline in circulation and cells. This regulation is one of the most ancient in evolution, far more so than regulation of body-temperature, for it holds sway from the teleostean fish to man. Whatever the concentration of the fluid of the external medium in salines from pond-water to sea-water, the salinity of the intimate medium bathing the living cells is always

regulated to correspond with between 0·7 and 0·9 per cent. of sodium chloride.

It is strange that the mechanism governing this vital regulation should not have been grasped before. The cells and circulating medium are saturated with colloids, and this amount of 0·7–0·9 per cent. of saline is just the amount the colloids are capable of holding in crystallo-colloidal adsorption. Any more is at once filtered away; any less, and life ceases.

There are many other applications in biology and medicine, but they cannot be treated within the compass of a letter. BENJAMIN MOORE.

14 Frognal, Hampstead.

The Audibility of Thunder.

IT has been stated that thunder is not usually heard at a greater distance than about twelve miles. This may be so during the day, but at night it can frequently be heard at a much greater distance from its point of origin. Some years ago I timed an interval between flash and sound over the sea, and found it to be more than two minutes. During the storm of September 5 last my son, Lieut. F. O. Cave, and I timed an interval by a method of counting seconds often adopted by photographers, with which method we were both familiar; one of us made it 140 seconds, the other 141 seconds. The flash was a particularly bright one; we had previously heard fainter thunder corresponding with less bright flashes, which were presumably a good deal further away.

On the night of October 1–2 a thunderstorm passed up-Channel to the south of this locality; any rainfall must have been beyond the Nab and the Warner lightships, as both lights were plainly visible; their distances are 17¼ and 16½ miles respectively if they are in their pre-war positions. With the help of an electric clock, which moves on every half-minute, supplemented by counting seconds, I made one time-interval 120 seconds and another 170 seconds; then with a stop-watch I timed an interval of 189 seconds.

During the storm of October 1–2 the pheasants crowed much more loudly than usual, especially at the early rumbles of thunder, or else the audibility was exceptionally good; probably the latter was the case, as the night was very clear and the air in the valley from which the crowing came would have been colder than the air here, a condition which would probably be favourable for good audibility of sounds coming from the valley, though it would scarcely account for the audibility of the much more distant thunder. It may be worth noting that the false cirrus above the thunder-cloud was lit up by light reflected from the aurora which was extremely brilliant at the time. C. J. P. CAVE.

Ditcham Park, Petersfield, October 6.

OPEN-AIR NATURAL HISTORY.[1]

MR. LOVELL'S book is the outcome of years of patient study, and will be welcome to botanists, entomologists, and bee-keepers. It deals with the inter-relations of flowers and insects, especially as regards pollination; it "treats of plants alive and in the midst of their home surroundings"; it justifies the author's prefatory remark that "the identification of a species should be regarded merely as an introduction and the beginning of a friendship long to be continued." The book is written with enthusiasm and popularly, but it is a scientific record of personal observations of great interest, and it includes some notes on modern theories which should be carefully considered. It is illustrated with conspicuously successful photographs, which have been taken on panchromatic plates to preserve in monochrome the proper colour values.

Beginning with a short historical sketch, in which tribute is paid to Sprengel, Hermann Müller, and Darwin, the author discusses wind-pollinated flowers, the *rôle* of hive-bees especially in relation to blue flowers, the humble-bee's favourite flowers which are mostly irregular in shape, the short-cuts taken to the nectaries, the crab-spiders which lurk in flowers and pounce on the insect-visitors, the "oligotropic" bees that rarely visit more than one kind of flower, the predominantly reddish butterfly-flowers like pinks and some Compositæ, the work of nocturnal moths in relation to flowers like evening primrose and honeysuckle, the fly-flowers like *Linnaea borealis* which is visited by the dance-fly (*Empis rufescens*), and those with nauseous odours like the carrion-flower and the skunk-cabbage, the usually injurious visits of beetles, flowers like wild roses, mulleins, and poppies which are visited for pollen, not nectar.

Mr. Lovell discusses the experimental evidence of the value of having conspicuous flowers and of colour-discrimination on the part of bees. In regard to the latter, however, the discussion is inadequate, for no experiments are conclusive that do not distinguish between colour as such and differences in intensity of illumination. A very interesting general chapter deals with the colours of flowers. Of the 4020 flowering plants in north-eastern America, the greens, whites, and yellows number 3001, while the reds, purples, and blues amount to only 1019. The latter are, on the whole, of more recent origin, and have evolved from the others, the selective agency of insects playing its part. In conclusion, the author discusses the value of bees in connection with fruit-growing, and notably in securing cross-fertilisation, the importance of which is very strongly emphasised.

The author has written a fine book on a fine subject, and his treatment should stimulate further study. We wish that he had been able to devote a special chapter to theoretical considerations, for, though he believes in the transmission of acquired characters, in the efficacy of insects as selective agents, in orthogenesis carrying plants beyond the limits of the advantageous, and in the evolutionary importance of crossing, he says tantalisingly little on these subjects. From an observer of Mr. Lovell's experience we should like to hear more.

(2) Mr. Step has written a delightful book on the industries of insects, which he arranges under headings corresponding with human occupations. He directs attention to the interesting fact that

[1] (1) "The Flower and the Bee: Plant Life and Pollination." By John H. Lovell. Pp. xvii+286. (London: Constable and Co., Ltd., 1919.) Price 10*s.* 6*d.* net

(2) "Insect Artizans and Their Work" By Edward Step. (Hutchinson's Nature Library.) Pp. x+318. (London: Hutchinson and Co., n.d.) Price 7*s.* 6*d.* net.

(3) "The Seashore: Its Inhabitants and How to Know Them." By F. Robson. Pp. 111. (London: Holden and Hardingham, Ltd., n.d.) Price 1*s.* 6*d.* net.

many of the activities are very specific and very intricate, yet there can be no help from parental instruction. "In the vast majority of species the parent is dead long before the daughter comes to that stage of existence when the necessity for making provision for her progeny arises, so the knowledge has to pass by way of transmitted memory. Somewhere in the minute speck of protoplasm constituting the egg of one of the solitary bees there is an infinitesimal particle of nerve matter which contains the secret of how to cut accurate circles and ovals of rose-leaf so that a number of them will overlap and curve into a perfect cylinder. During the greater part of its life the creature that hatches out from that egg will have no need of the secret, but the germ of it will go on developing, and when the insect has attained to the complete bee form there is the idea in the memory cells ready to instruct the nerves that govern the action of wings and legs and cutting jaws." We have quoted this at length, for it expresses Mr. Step's view of the big riddle that lies behind his book. Unfortunately, we do not know how the secret is kept in the egg before there is any particle of nerve matter, or how the insects get the knowledge which forms the contents of the transmitted memory, or whether they really have an idea which instructs the nerves. But the author usually chooses the wise path of keeping to the facts, and gives us a charming account of spinners and weavers, miners and masons, carpenters and wood-workers, upholsterers, wax-workers, paper-makers, tailors, horticulturists, sanitary officers, musicians, burglars, and lamp-bearers. The book is fresh and competent, and the illustrations (two of which are here reproduced) deserve high praise, both the photographs by the author and the drawings by Mr. Carreras.

(3) Mr. Robson's little book attempts the impossible, and does not succeed. The space is, indeed, inadequate for an interesting account of the inhabitants of the seashore, but it might have been used more skilfully; the illustrations are not very happy; there are several inaccuracies in the brief text; and there are far too many misprints. Several excellent inexpensive guides to the seashore, as much within children's compass as this book is, are readily available.

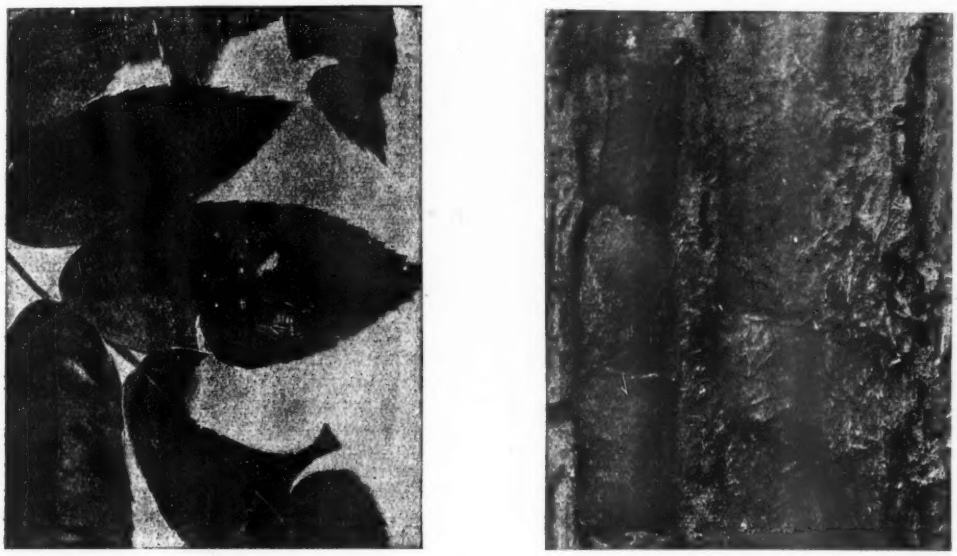

FIG. 1.—Leaf-cutter Bee. The left photo shows the bee at work. The right photo is a section of an old post and shows the thimble-shaped cells made from the cut portions of leaves. From "Insect Artizans and their Work."

THE RECONSTRUCTION OF THE FISHING INDUSTRY.

IN November of last year the National Sea Fisheries Protection Association made proposals for a unification of fishery administration, and it embodied these in a "Memorandum" (which was referred to in NATURE of November 28, 1918, p. 248). The memorandum was submitted to Mr. Prothero, who doubtless acquainted the Cabinet with its provisions, but that was all that happened. Eight months afterwards the Government introduced a Bill for the establishment of a Standing Fishery Advisory Committee, and for the removal of the statutory limitation of the salary of the President of the Board of Agriculture and Fisheries!

The 1918 memorandum recommended the creation of a United Kingdom Ministry of Fisheries, but its authors found that they were "up against" the opposition of the Scottish industry. So when a special joint committee of the association pre-

pared a scheme for fishery research, statistics, education, and propaganda they took care to avoid this and other obstacles. They recognised that the only logical way of co-ordinating all British agencies for fishery development was by the setting-up of an Imperial authority; but they also recognised that this ideal was unattainable. Some other statutory body for the co-ordination of research and education would have been agreed upon by the various sections of the British industry, but the committee then found that the fishery Departments were "unlikely to acquiesce in the formation of any central authority other than a Ministry of Fisheries, to be superimposed upon them from without." In the face of *this* formidable opposition the committee had to do the "next best," and, abandoning any really comprehensive way of making use, to the greatest advantage, of all fishery workers, they have made a compromise that may be practicable. In order that as few people as possible may object, they do not recommend the formation of anything in the way of a "Super-Department." Assuming that the existing fishery authorities are to be properly financed and organised as permanent secretariats, and that each of them will then proceed to set up a scientific branch with a director of scientific work, they propose that the three permanent secretaries shall then sit as a joint research board, with such official and non-official assessors as they may nominate. The hope (uncoloured by conviction) is then expressed that the assessors may form the means of communication between the officials, the industry, and the non-official investigators.

The joint research board, so constituted, is not to be, in general, an executive body controlling research. Obviously not, for agreement could not be obtained on points of difference between officials, and departmental privilege would be too great a factor. It is to deliberate on schemes of research and transmit plans and estimates prepared by the departments. But it is recommended that it shall control the collection of fishery statistics, set up a joint editorial board which will publish all results—administrative, statistical, and scientific—in uniform style and with promptitude, and establish and carry on (through an editorial staff) a Fisheries Journal which will be, in the main, popular in character. A strong plea is made for some reform in the manner of publication, for speedy production, for some relief from the exceeding dulness and clumsiness of governmental Blue Books, and for a "break away" from the methods of H.M. Stationery Office.

Considering the things to be investigated, the Committee recognise five categories of research, and set these out in detail: (1) Practical administrative problems to be studied by the departmental staffs; (2) fish culture; (3) industrial research; (4) speculative research; and (5) oceanography. Fish culture is obviously work for the departments, and, since the fishing industry does not seem likely to undertake industrial research itself, this must be done by the Government. Speculative research—a very large category of investigations—ought to be relegated to the universities and marine biological stations, with some other subjects included in the category of industrial research and in that of oceanography. Since the departments must possess and equip sea-going vessels for their practical administrative investigations, it is obvious that they should also carry out the oceanographic observations at sea, but the working up of these should be done by the unofficial State-aided institutions. And so, it is hoped, everybody will be satisfied, and the best use possible made of all the talents.

A provisional scheme for fishery education, training, and propaganda is appended. This includes the training of administrative and scientific officers, and of men occupying responsible industrial posts, by the provision of Government fellowships tenable as post-graduate studentships at the universities; fishery colleges at Liverpool and Aberdeen; fishermen's classes carried on locally and a scheme of fishery apprenticeship. The latter proposals are most interesting. Immediately upon the outbreak of war hundreds of vessels and thousands of men were placed at the disposal of the Admiralty, and, without any special training, the duties of mine-sweeping, patrolling, and escorting were carried out in such a way as to earn loud expressions of admiration and gratitude. There were exceptional losses due to war risks and natural decrease; the training of lads largely ceased during the period of war; the old system of apprenticeship has become obsolete and, in view of naval defence and in the interest of the industry itself, a better class of lad is now desirable. The interesting suggestion is made that a number of the trawl-vessels built during the war by the Admiralty be detailed and equipped as training-vessels, and a scheme of apprenticeship is recommended.

This scheme was worked out in detail by the industry as soon as it was seen that peace was assured. It is an integral part of any attempt at fishery reconstruction and naval defence. It was submitted to the Government nearly a year ago, and it has been "under consideration" ever since then! Meanwhile the Admiralty trawlers are being offered for sale.

Summary of Main Recommendations.

(1) That the Government be requested to provide funds for a comprehensive scheme of research statistics for the fisheries of the United Kingdom on the lines set forth in this report.

(2) That each Fishery Department be provided with a suitable scientific staff under a scientific director with well-equipped laboratories, and with sufficient steamers for research work and for the exploration of our fishing grounds.

(3) That the Fishery Departments be requested to adopt the best means they can devise for securing the uniformity of fishery statistics, and the co-ordination of research work throughout the United Kingdom.

(4) That the Fishery Departments make suitable provision for the publication of scientific reports which

are of importance to the industry, and in particular for the publication monthly of a fishery journal containing all information in regard to scientific results, statistics, statutes, orders, foreign intelligence, commercial information, and all other information likely to be of benefit to those carrying on the industry.

(5) That the Fishery Departments and the Education Departments of the three kingdoms be requested to co-operate in providing a scheme of education on the general lines laid down in the report.

NOTES.

THE British Association, as an outcome of the comprehensive review of scientific work during the war, which formed a conspicuous part of the programme of the recent meeting in Bournemouth, has addressed the following resolution to the Prime Minister and the Treasury:—"The British Association for the Advancement of Science, in reviewing the results of scientific method applied to military and other practical arts, recognises that the successful issue of the war has sprung from the efforts of scientific men concentrated on those problems, and with the conviction that the well-being and security of the nation are dependent on the continuous study of such matters, would urge on H.M. Government the necessity for apportioning an adequate sum from that allocated to home administration and the upkeep of the fighting forces for the purpose of a definitely organised scheme of research, as, for example, on problems connected with health, food, and commerce, on explosives, on chemical warfare, and on physical and engineering problems bearing on military work." Similar resolutions, in varying terms according to the special cases, have been forwarded to the First Lord of the Admiralty, the Secretary for War, the President of the Board of Trade, and the Ministers of Health and Food.

THE appointment, as recently announced, of Prof. S. J. Chapman to be joint Permanent Secretary of the Board of Trade, owing to the transfer of Sir William Marwood to the Ministry of Transport, will be welcomed by all who know him. Prof. Chapman, who had held the professorship of political economy at Owens College, Manchester, since 1901, acted during the war as head of the temporary Industrial (War Inquiries) Branch of the Board of Trade, and in 1918 was appointed head of a new General Economic Department created for the purpose of assisting the Permanent Secretary in relation to questions involving economic policy. He is a fellow and member of council of the Royal Statistical Society, to the Journal of which, and to that of the Manchester Statistical Society, he has made numerous contributions bearing mainly on the cotton industry of Lancashire.

IN the *Times* of October 11 is a letter from Prof. J. Johnstone on the subject of the extension of territorial waters in relation to deep-sea fishing. It is pointed out that the information at present available is not sufficient to enable satisfactory regulations to be drafted, and that, therefore, administrative authorities should not be given legislative powers which they cannot exercise properly. Prof. Johnstone also states that scientific investigation of our sea fisheries has never been properly organised and supported, and is in a worse condition now than it ever was. We agree with him that fishery investigations in this country have been quite inadequate, and we hope in the near future to see the establishment of an organisation for the comprehensive scientific study of the sea, so important for a great maritime nation, on a scale proportionate to the magnitude of our interests.

CHANGES in the Meteorological Office staff have recently been made, and the following appointments have been announced:—Mr. R. G. K. Lempfert becomes assistant director, and takes general oversight of observations and stations contributing observations to the Office. Mr. Lempfert entered the Meteorological Office in 1902, and has been superintendent of the Forecast Division since 1910. Lt.-Col. E. Gold becomes assistant director, in charge of forecasting. Col. Gold graduated as Third Wrangler in 1902, and was elected Fellow of St. John's College, Cambridge, in 1906; he was Schuster reader in dynamical meteorology from 1907 to 1910, and he then became superintendent of statistics at the Meteorological Office. On the formation of the meteorological section of the Royal Engineers in 1915 he was appointed to the command of the overseas contingent at G.H.Q., France. Capt. D. Brunt is made superintendent of the work for Army services. Capt. Brunt was in the meteorological section of the Royal Engineers during the war, and acted under Col. Gold. Mr. Carle Salter becomes superintendent on the staff of the Meteorological Office for the British Rainfall Organisation. Mr. Salter has recently been assistant director of the British Rainfall Organisation, which has now come under the control of the Meteorological Office.

IN connection with the International Meteorological Committee, appointed by the International Conference at Innsbruck, 1905, a meeting of available members was held at the Meteorological Office, London, on July 3–9 last, and a copy of the minutes which have been printed has reached us. Since 1905 the committee has met in Paris (1907), Berlin (1910), and Rome (1913). The July meeting was of a semi-official character, and was really to prepare the way for the Paris meeting, which commenced on September 30. The president, Sir Napier Shaw, in his introductory statement directed attention to the changes caused by the great war, and especially to the new meteorological organisations developed. It was felt that the extent and detail of international co-operation must be much greater in the future than it had been in the past, but the problems are essentially of the same nature as formerly. The great development of aviation has introduced new requirements in respect of information concerning the upper air obtained by pilot-balloons or in other ways. The hours of observation for Europe were considered; 1h., 7h., 13h., and 18h. have become general, but it has been suggested that preference might perhaps be given to 3h., 9h., 15h., and 21h. Consideration was given to North Polar investigation in co-operation with Amundsen's expedition, and there was a proposal for the establishment of a meteorological station in the Island of Jan Mayen for observations from the summer of 1920 to the autumn of 1922. Necessarily much attention was devoted to the coding of messages and to the method and nature of the observations.

THE Harveian Oration will be delivered at the Royal College of Physicians by Dr. Raymond Crawfurd on Saturday, October 18, at 4 p.m.

WE regret to record that *Engineering* has suffered a severe loss in the death of Mr. B. Alfred Raworth, who had long been a member of the staff, and taken a prominent position in the editorial management during the past thirteen years. Mr. Raworth was a trained engineer, and had considerable experience prior to joining the staff of *Engineering* in 1882. He was a member of the Institution of Mechanical Engineers, of the Iron and Steel Institute, and of the Institute of Metals.

THE *Engineer* for October 16 records the death of Sir Charles Chadwyck-Healey, who had been intimately associated with our contemporary throughout the greater part of his life. Sir Charles was the only son of the founder of the *Engineer*, and was trained for the Bar, from which he retired after a successful career in 1893. During the war he performed a national service of great utility in fitting out at his own expense the hospital ship *Queen Alexandra*, and commanded her until she was discharged a few months ago.

WE regret to record the death, on October 5, of Mr. G. W. Palmer, who was appointed senior mathematical master and master of the Royal Mathematical School at Christ's Hospital in September, 1911. Educated at Dover College and Trinity College, Cambridge, Mr. Palmer did valuable work as mathematical master first at the Royal Naval School, Eltham, and afterwards at Clifton College, where he became head of the military side. An enthusiast in all matters educational, and a prominent member of the Mathematical Association, he kept in close touch with the best modern ideas on the treatment of his subject. Owing to his strong influence, more time was given to important principles and fresh ideas, while elaborate development in any one direction was avoided or postponed. The result has been that Christ's Hospital boys have shown increased interest in their mathematical work and a high general level of achievement—and this, too, without affecting the standard attained by boys preparing for the universities. During a brief reign of eight years Mr. Palmer accomplished a notable and valuable work of lasting benefit to Christ's Hospital. His death is a very severe loss to the school.

THE Society for the Prevention and Relief of Cancer has issued a pamphlet, "Cancer Research and Vivisection," summarising in tabular form the number of experiments returned by cancer institutes in the last fourteen years. The author holds that animal experiment in cancer is a futile waste of money, and ought to be stopped. Illustrations are reproduced showing infiltrative growth and metastasis-formation in experimental cancer, but the author suggests that experiment can throw no light on these conditions in the human subject. The aims of the society include the provision of hospitals for cancer patients, the statistical study of cancer, and legitimate (*sic*) experiment. No indication is given of what kind of experiments are contemplated, although needles and syringes for animal inoculation are figured in the book. Pamphlets have also been published on the use of violet-leaves and on the influence of tea-drinking. The society has been in existence for seven years, but its efforts seem to have had no effect on cancer mortality.

THE September–October issue of the *Scottish Naturalist* contains some extremely interesting notes by Mr. Donald Guthrie on the birds of South Uist. Among these, Mr. Guthrie remarks of the greylag goose that its wariness baffles description, yet goslings of this species which he hatched out from a clutch of eggs placed under a hen proved as amenable to domestication as ordinary tame geese. In their second year two females of this brood bred near the house without the slightest sign of shyness. A third disappeared for several weeks, then returned with a brood of goslings, and took up her place, accompanied by her family, with the fowls round the house. Her mate, who accompanied her, for a day or two held aloof, but on the third day took his place with the rest and stayed there. Having regard to the interest attached to the oft-discussed theme as to the origin of our domesticated geese, this case is worthy of note.

IN Report No. 1 of the Industrial Fatigue Research Board Dr. H. M. Vernon describes "The Influence of Hours of Work and of Ventilation on Output in Tinplate Manufacture." The tinplate industry is a very strenuous one, especially as concerns the millmen, for they are responsible for rolling out the red-hot tinplate "bars" into thin sheets of steel, which are afterwards tinned. The tinplate mills run continuously from Monday morning until Saturday afternoon, and, as a rule, the men work in eight-hour shifts. If there is a breakdown of machinery or shortage of material, the men are often put on to six-hour shifts instead, and sometimes even on to four-hour shifts, so as to give them all some employment. Consequently one is able to obtain trustworthy evidence as to the effects of such shortened hours on output. Arguing from numerous statistical data collected at a number of tinplate works, Dr. Vernon found that when the men were transferred to six-hour shifts their hourly output went up about 10 per cent., and when to four-hour shifts, it went up 11·5 per cent. This improvement is not so great as would be brought about by a thoroughly efficient system of ventilation, for it appeared that in works without artificial ventilation there was a marked seasonal variation of output, and in the hottest weeks of the year the output was 11–18 per cent. smaller than in the coldest weeks. In the ventilated factories the seasonal variation was much less, but even in them there was plenty of room for improvement. The report is illustrated by photographic reproductions of the millmen under working conditions.

ONE of the commonest and most disfiguring abnormalities of the modern mouth is a forward protrusion of the upper incisor teeth, with which is usually combined a retraction of the chin and a crowding of the lower incisor teeth. On this condition Mr. D. M. Shaw, curator of the Prosthetic Laboratories, Royal Dental Hospital of London, has recently thrown quite a new light (*Lancet*, August 23). He has shown that a certain "perverted functional activity" of the tongue will produce the series of anomalies which dentists have so often to correct in the mouths of modern children—forward protrusion and obliquity in the upper incisors, with retraction and uplift of the lower incisors. Mr. Shaw directs the attention of dentists to the strength with which the tongue can be made to press against the anterior part of the roof of the mouth, particularly behind the upper incisors, thus exerting a much greater power to produce deformity than is used by dentists to correct malposition of the teeth. Tongue-pressure of this nature is particularly common among children, especially when eating soft or pulpy food, being really a form of tongue mastication. This form of mastication appeals to children because it yields a fuller sense of taste if the food is sweet or agreeable than the legitimate use of teeth and gums. The point which is quite new in Mr. Shaw's demonstration is that during the palate-pressure action of the tongue the genio-glossus muscle exerts a retracting action on the chin region of the lower jaw.

A USEFUL article on "The Climate of Liberia and its Effect on Man," by Mr. Emory Ross, appears in the *Geographical Review* for June last. The passages on "European life on the West Coast" in general, on "tropical hygiene," and on "the nervous strain of the tropics" offer conclusive advice to those who may, in an idle moment, have thought of emigration. By immense efforts acclimatisation of the white

man might be rendered possible, but at present his relation to the African West Coast "can be only one of tolerance."

THE manganese ores of the Shimoga and adjacent districts are interestingly described by Mr. B. Jayaram, Senior Geologist to the Department of Mines and Geology of Mysore (Records, vol. xvi., part 2, 1917). The author suggests that percolating waters have brought the manganese, and the iron with which it is always associated, from the silicates of the basic chloritic schist series, and have deposited the ores as a replacement of the limestones and grits in which they are now found. The rocks termed limestone and grit are not true sediments, but secondary products of an igneous complex.

ATTENTION was directed to the magnesite deposits of Canada in NATURE, vol. c., p. 490, 1918. Those of Bulong, north-east Coolgardie goldfield, are now described by the Geological Survey of Western Australia (Bulletin 82, 1919). The magnesite, which is in numerous veins a few inches wide, has arisen from the decomposition of a great band of serpentine, and it is suggested that augite as well as olivine has supplied the magnesium required for its formation. The silica set free is probably responsible for the capping of "siliceous laterite, usually opaline in composition," which is stated to occur in the magnesite areas. The value of the magnesite is estimated at 1*l.* per ton on the ground, the export value being nearly 4*l.* per ton.

ONE of the means by which supplies of potassium compounds were eked out during the war period was the recovery of potassium salts from the flue-dust which occurs as a waste product in the manufacture of Portland cement. The principal methods employed depended upon treatment of the flue-gases by water-sprays or by a process of electrical precipitation. An account of the various installations devised for the purpose has been published by the Department of Mines, Ottawa (Bulletin No. 29, "Potash Recovery at Cement Plants"). It contains descriptions of the recovery systems developed at a number of cement factories in the United States, together with an historical review of the whole question and full references to the literature of the subject.

ATTENTION may be directed to a useful series of articles on the mechanical handling of chemical materials, by Mr. G. F. Zimmer, which have recently appeared in the *Chemial Age* (Nos. 10 to 15). It has been remarked that chemical works in this country are rather poorly equipped with labour-saving machinery. In present circumstances, when the cost of manual labour has increased so greatly, it may be necessary to pay more attention than formerly to devices which will reduce this cost. The articles in question will help to show how this may be done. They are illustrated, and well worth consulting by chemists in charge of factories.

MESSRS. LUMIÈRE AND SEYEWETZ have published in the *British Journal of Photography* (October 3, Colour Supplement) a simplified method for the development of autochrome plates. The developer is prepared of two degrees of concentration, so arranged that if the weaker is applied first to the plate, the time that is taken in producing the first outlines of the image (neglecting the sky) will be exactly the time that the stronger solution will require to complete development. Although a watch or clock may be used for the timing, a simple sand-glass has many advantages. The sand is started running when the weaker solution is applied, then on the first appearance of the image the glass is put on its side; the weaker solution is poured off and the stronger poured on, and the sand-glass put upright. When the sand has flowed back again the development is complete. In the formula given the concentrations of the developers are as 1 to 10.

SIR CHARLES BRIGHT read a paper on "Inter-Imperial Communication, through Cable, Wireless, and Air Methods," before the Section of Economic Science and Statistics at the Bournemouth meeting of the British Association. He pointed out that it is conceivable that national and imperial interests can be adequately provided only by the State controlling at least one complete cable to all points of the British Empire, supplemented by an all-British wireless chain. The recently established Telegraph Communications Board, first urged by the author seventeen years ago, is intended for generally controlling and developing inter-imperial telegraphic and aerial communication in national and public interests. By this scheme all the Government departments concerned (strategic as well as civil) are represented by delegates, who meet periodically to discuss and settle all matters germane to the subject. This should do much towards improving the previously existing arrangements by which the Post Office alone represented the Government. Besides increased cable and wireless facilities being necessary and the war devastations made good, it is highly desirable that improved methods of message condensation should be introduced so as to get the best results from existing facilities. The field open to inter-imperial air communication is considerable; air organisation and air routes are amongst the important questions of the day, and it is suggested that all aerial mail communications should be rationed.

AN important paper on the theory and use of radio-direction-finding apparatus by Capt. A. S. Blatterman, of the U.S. Army, appears in the Journal of the Franklin Institute for September. It is known that in radio stations it is sometimes possible to hear signals when the antenna is disconnected from the apparatus. Hence the passing waves induce sufficient electromotive forces in the coils of the receiver to produce audible signals. An investigation was therefore carried out in the U.S. radio laboratories in 1917 and 1918 to find out the most efficient shape of coil to receive signals directly. As the loudness of the signals varies with the position of the coil, an investigation was also made of the most efficient shape of coil for direction-finding. Elementary theory would lead us to suppose that the coil would be more effective the larger its cross-section and the greater its time-constant. It would also appear that the loudness of the signals is inversely proportional to the square of the wave-length. This, however, is not the case. The experiments recorded in this paper prove that there is a certain size of coil which gives the best results for a given wave-length. This was traced to the fact that the resistance of the coil varies with the wave-length. For very long wave-lengths the resistance has its ordinary value. As the wave-length is shortened, and therefore as the frequency is increased, the resistance increases slowly until it is two or three times its ordinary value, and it then increases with great rapidity. This effect makes the reception bad at high frequencies. There is, therefore, a certain sized coil which produces the best effects. The results of the experiments described prove this conclusively. A thorough investigation is also given of the directional characteristics of this type of receiver, and many curious properties depending on its height above the ground were discovered. Using a properly constructed coil in an ordinary room and a seven-stage amplifier, the signals issued by all the high-power European stations could easily be heard.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS OF COMET 1919*b*.—Messrs. Braae and Fischer Petersen give the following continuation of this ephemeris (for Greenwich midnight) in *Ast. Nach.*, 5008:

		R.A.			Decl.		Log r	Log Δ
		h.	m.	s.	° ′			
Oct.	17 ...	11	55	29	8 55	N.	9·6856	9·9440
	21 . .	12	3	20	5 10			
	25 ...	12	12	36	1 36	N.	9·7225	0·0289
	29 ...	12	22	44	1 43	S.		
Nov.	2 ...	12	33	18	4 47	S.	9·7962	0·0932

The comet is in perihelion October 16·9, so it should still be an interesting object, though its distance from the Earth has greatly increased. It is rather inconveniently placed in the morning sky, but observations of position are much desired.

THE ALBEDO OF SATURN'S RINGS.—The *Astrophysical Journal* for July contains a paper on this subject by Mr. L. Bell. It is considered that the very high albedo of the brighter parts of the rings indicates that much of the matter forming them exists in the form of optical dust of dimensions comparable with a wave-length of light. Mr. Bell quotes the familiar fact that many substances appear of a lighter colour when powdered than when in large blocks. He gives 15 km. as the thickness of the main parts of the rings, slightly greater at the outside of ring B and the inside of ring A. He suggests that there are dust-clouds of exceedingly small density on each side of the ring-plane, to explain the nebulous patches seen when the ring is edgewise. He points out that light-pressure would come into play in the case of this fine dust, and help in its diffusion. It is supposed that there are some larger lumps in the main rings, and by a combination of dynamical and optical arguments he fixes their diameters as being of the order of 3 metres. Mr. Bell makes use of Prof. Barnard's photographs, and also of those of Prof. Wood in monochromatic light.

THE SELECTION OF SITES FOR ASTRONOMICAL OBSERVATORIES.—The importance of studying atmospheric conditions before choosing sites for observatories intended for work of a delicate character on the sun or planets is becoming increasingly recognised. Prof. W. H. Pickering gives some interesting details of the station established by the Harvard Observatory at Mandeville, Jamaica, altitude 2000 ft. (*Popular Astronomy*, August-September). The air is of such extraordinary clearness that the star γ Volantis, magnitude 3·7, is frequently visible to the naked eye, although its maximum altitude is 1° 40′. A photograph is reproduced, taken with a small stationary camera, which shows a very clear trail of β Carinæ, altitude 2° 40′.

Prof. Pickering's experience, contrary to the impression of many astronomers, is that the seeing is at its best when the air is heavily charged with moisture.

It will be remembered that much work on Mars has been done at Mandeville in recent years.

FORTHCOMING BOOKS OF SCIENCE.

AGRICULTURE AND HORTICULTURE.

Edward Arnold.—Gardens: Their Form and Design, Viscountess Wolseley, illustrated. *Cassell and Co., Ltd.*—The Garden Month by Month, H. H. Thomas, illustrated; Garden Handbook for Beginners, H. H. Thomas, illustrated. *Constable and Co., Ltd.*—Forests, Woods, and Trees in Relation to Hygiene, Prof. A. Henry, illustrated.—*Hodder and Stoughton.*—Chemistry and Bacteriology of Agriculture, E. J. Holmyard, illustrated (The New Teaching Series of Practical Text-books). *Hutchinson and Co.*—Gardens of Celebrities and Celebrated Gardens, J. Macgregor, illustrated. *Macmillan and Co., Ltd.*—Science and Fruit Growing: Being an Account of the Results Obtained at the Woburn Experimental Fruit Farm since its Foundation in 1894, the Duke of Bedford and S. Pickering. *John Murray.*—Conifers and their Characteristics, C. C. Rogers. *Oxford University Press.*—Effects of the Great War upon Agriculture in the United States and Great Britain, Prof. B. H. Hibbard; United States Forest Policy, J. Ise.

ANTHROPOLOGY AND ARCHÆOLOGY.

W. E. Harrison (Ipswich).—Pre-Palæolithic Man, J. Reid Moir. *Hutchinson and Co.*—The Ruined Cities of Northern Africa, Dr. R. Sturzenbecker, illustrated. *Macmillan and Co., Ltd.*—An Introduction to Anthropology: A General Survey of the Early History of the Human Race, Rev. E. O. James; The Ila-Speaking Peoples of Northern Rhodesia, Rev. E. W. Smith and the late Capt. A. M. Dale, 2 vols., illustrated; Among the Natives of the Loyalty Group, Mrs. E. Hadfield, illustrated. *John Murray.*—Travels in Egypt and Mesopotamia in Search of Antiquities, 1886–1913, Dr. E. A. Wallis Budge, 2 vols., illustrated. *Oxford University Press.*—James Tod's Annals and Antiquities of Rajasthan, edited with an introduction and notes by Dr. W. Crooke, 3 vols., illustrated.

BIOLOGY.

A. and C. Black, Ltd.—Outlines of the History of Botany, Prof. R. J. Harvey Gibson. *Cassell and Co., Ltd.*—Under-water Glimpses of Animal Life, Dr. F. Ward, illustrated. *Constable and Co., Ltd.*—The Sea Fisheries, Dr. J. T. Jenkins, illustrated. *Hodder and Stoughton.*—Applied Botany, G. S. M. Ellis, illustrated (The New Teaching Series of Practical Text-books); The Book of a Naturalist, W. H. Hudson; The Mason Wasps; The Sacred Beetle; The Story Book of Birds and Beasts; and The Story Book of Science, each by J. Henri Fabre, translated by A. Teixeira de Mattos. *Henry Holt and Co.* (*New York*).—The Development of the Chick, Prof. F. R. Lillie, new edition. *J. B. Lippincott Co.*—In Monographs on Experimental Biology and General Physiology: The Nature of Animal Light, Prof. E. Newton Harvey; The Chromosome Theory of Heredity, Prof. T. H. Morgan; Inbreeding and Outbreeding: Their Genetic and Sociological Significance, E. M. East and D. F. Jones; Pure Line Inheritance, Prof. H. S. Jennings; The Experimental Modification of the Process of Inheritance, Prof. R. Pearl; Localisation of Morphogenetic Substances in the Egg, Prof. E. G. Conklin; Tissue Culture, Prof. R. G. Harrison; Permeability and Electrical Conductivity of Living Tissue, Prof. W. J. V. Osterhout; The Equilibrium between Acids and Bases in Organism and Environment, Prof. L. J. Henderson; Chemical Basis of Growth, Prof. T. B. Robertson; and Co-ordination in Locomotion, A. R. Moore. *Longmans and Co.*—A Naturalist's Sketch Book, A. Thorburn, illustrated. *Methuen and Co., Ltd.*—Iron Bacteria, D. Ellis, illustrated. *Oxford University Press.*—Fungal Diseases of the Common Larch, W. E. Hiley, illustrated. *Bernard Quaritch, Ltd.*—Essays in Early Ornithology, J. R. McClymont, illustrated. *G. Routledge and Sons, Ltd.*—The Wonders of Insect Life, J. H. Crabtree, illustrated. *S.P.C.K.*—Joseph Dalton Hooker, Prof. F. O. Bower (Pioneers of Progress: Men of Science). *Witherby and Co.*—A Geographical Bibliography of British Ornithology, H. Kirke Swann, W. H. Mullens, and F. C. R. Jourdain; A Hand-

book to the Vertebrate Fauna of North Wales, H. E. Forrest; The Birds of France, C. Ingram; A Practical Handbook of British Birds, in parts; Monograph of the Pheasants, W. Beebe, vol. ii.

CHEMISTRY.

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THE BRITISH ASSOCIATION AT BOURNEMOUTH.

SECTION E.

GEOGRAPHY.

OPENING ADDRESS BY PROF. L. W. LYDE, M.A., PRESIDENT OF THE SECTION.

The International Rivers of Europe.

THIS subject was chosen before the publication of the Treaty of Peace, and was dictated by a wish to combine my geographical creed with the political conditions of an "Americanised" Europe. The Treaty embodies so many of the principles which I wished to emphasise that my treatment should perhaps now be rather historical than political.

My geographical faith is in Outlook; the jargon of to-day is about Leagues of Nations. This is the day of nations and nationalities, and geographers must rejoice in the fact, because civilisation depends on a blend of varied influences—each an individual element, a *genius loci*—and the triumph of nationality must curb that tendency to a drab cosmopolitanism which would crush out all such variety. But these varied influences cannot blend into a progressive civilisation unless they have all possible facilities for friendly meeting; for instance, international rivers should not be, like international finance, anti-national, but really inter-national, "between nations," common to all nations, and encouraging the friendly meeting of diverse political elements and ideas. Liberty always makes for differentiation—in nations as in individuals; and if our international intercourse becomes really "free," the desired variety is guaranteed.

That is why I should like to press the truth that Outlook is, or ought to be, the motto of geography. It is so for many of us, and it ought to be for all. But the word covers both a process and an objective. The outlook is essentially over big Mother Earth; the process is visualisation—the picturing of forms and forces, places and peoples, beyond the horizon, all possible horizons being included in the one great unit of the globe. But the geographical interaction of the man and the place cannot be dissociated—least of all in political geography—from the historical interdependence of group and group. Both alike are concerned with progress. We want to know, therefore, the whole simple truth—what the particular features and phenomena mean as world-features and world-phenomena, *not* what special meaning can be read into them, or extracted from them, by some local and interested political unit. Geography is, first of all, the visualisation of the world and the relations of the various parts of that world.

Now, the one predominant feature of the earth's surface is not land, but water. Nearly all international problems to-day have to do, explicitly or implicitly, with the ocean, *i.e.* with access to cheap water transport on the medium which covers three-quarters of the whole surface of the earth. Even the problem of Alsace-Lorraine, itself perhaps purely

a land problem, conceals—especially from the Swiss point of view—a problem of access to the sea; and the problems of Poland, of Italy, of Jugo-Slavia, are obviously sea problems, or sea problems very slightly disguised.

It is a truism that the ocean attracts rivers and their trade and their riverine population. Industry, commerce, even culture, have been starved and stunted in various parts of the world by lack of easy access to the sea. Even your League of Nations idea has more than once approximated to a substantial fact—round the Mediterranean and round the Baltic, facilitated by inter-national or inter-racial rivers. The Hanseatic League was essentially based on the relation of a number of more or less navigable rivers to an inland sea, and that was why it came to include such distant "inland" members as Breslau and Cracow.

Accessibility is now more than ever before a supreme factor in all cultural and economic development, and rivers are still the chief natural intermediaries between land and sea. The first real international attempt to solve the problem of international rivers followed the victory of sea-power over the France of Napoleon the Great; the second has followed the victory of sea-power over this would-be "Napoleon" of Prussia.

Now, I submit that to many of us the mere word "river" by itself suggests, at once and primarily, a physical unity—no doubt, with some variety of relief and climate—and that on this physical unity we are prepared to sanction some social and economic, and even political, unity. But directly you add the qualifying "international," the suggestion changes; the adjective raises a picture not of local features, but of regional relations.

In recent years I have pleaded for the use of rivers as political boundaries—on the ground that they clearly separate lands without at all separating peoples except in time of war; we want to preserve the valuable variety of political and cultural units, but to draw the various units together. Our object is unity, not uniformity. The proposal has been objected to—even by some who are not at heart hostile to the idea of fostering all possible aids to the easy, honourable, friendly intercourse of peoples—on the ground that rivers shift their courses. They do, and trouble has come of this in the past, political trouble as well as economic. The Missouri was a fertile source of inter-State squabbles. But no normal person would *choose* a mud-carrier, like the Missouri, as a political boundary unless there was marked difference of racial type or nationality running approximately along the line of the river. In fact, I would suggest that the troubles along the Upper Missouri were really due to the fact that the river was *nowhere* an inter-State boundary, and therefore each State claimed the right to monopolise it in the particular section. If it had been an inter-State boundary from the first, such a claim would have been obviously absurd. And it was the iniquity of the claim to monopoly that forced the United States, as similar conditions forced the Australian Commonwealth, to take over the control of the inter-State rivers.

The principles behind the control are significant. Thus the Murrumbidgee is entirely within New South Wales, as the Goulburn is entirely within Victoria; but the Murray is an inter-State river—in a double sense, acting as the boundary between New South Wales and Victoria, and emptying through South Australia. New South Wales has entire use of the Murrumbidgee, and Victoria of the Goulburn, but the whole volume of the Murray up to normal low-water level is left to South Australia. In Europe navigation is usually far more important than irrigation. Why should not Europe exercise similar control over the navigable rivers of Europe?

For, geographically, great navigable rivers are essentially a continental feature, *i.e.* really a world feature, for all major continental features must be included in a survey of world features, even if they are minor world features; and the world can recognise no right of a political unit to regional monopoly of the commercial advantages of such a feature to the disadvantage of other political units—least of all, others in the same region. As with the irrigation, when a river is obviously and entirely within an area where identity of culture and sentiment proclaims a natural or national unit, then that unit has a claim—even if it should prove impolitic to press it—to some monopoly of the facilities afforded by that river. But when the river runs through or between two or more such natural or national units, *i.e.* is really international, one of the units has no claim to any monopoly against the other or others.

It was reasonable that expanding Prussia should get to the mouth of the Elbe, and it was certain that Holstein had been both a fief of the Holy Roman Empire and in the German Confederation of 1815, and that succession in Holstein could *not* go in the female line. It was equally certain that Schleswig had never been in either the Holy Roman Empire or the German Confederation, and that succession in Schleswig *could* go in the female line. The reasonable sequel in 1864 would have been for Prussia to purchase Holstein from Denmark, and share the facilities of the international river.

One would not expect such a view to be taken by a Prussian, but that was the actual principle laid down by France nearly one hundred years earlier. The famous Decree of November 16, 1792, asserted that:—"No nation can, without injustice, claim the right to occupy exclusively a river-channel, and to prevent the riparian States from enjoying the same advantages. Such an attitude is a relic of feudal slavery, or at any rate an odious monopoly imposed by force." This was not mere talk. It was followed in 1793 by the complete freeing of the Scheldt and the Meuse to all riparians—France herself being a riparian in each case, for the Scheldt was naturally navigable up to Valenciennes. Somewhat similar rights were extended in 1795 to all riparians on the Rhine—France herself, of course, being again a riparian; and in 1797 the freedom was extended, so far as France was concerned, to the ships of foreign nations, though Holland was able to make the privilege valueless.

The original Decree had not pressed the precise question of internationality. But if the general principle holds—that a great navigable river cannot be monopolised by a single political unit against riparians, even if they are its subjects and of alien "race," still more must it hold when the river in question is fully international, flowing through or between two or more States. Of course, the Rhine, Danube, and Vistula do both.

As a matter of fact, in Europe this principle has been generally accepted for the last century except by Holland. Prussia and Saxony agreed about the Elbe in 1815, and the agreement was extended to Austria, Hanover, and Denmark in 1821. Prussia, Hanover, and Bremen made a similar agreement about the Weser in 1823; and Spain and Portugal made similar agreements about the Tagus and the Douro in 1829 and 1835. Holland, however, has a tarnished record.

One has not an atom of sympathy with the arrogant German demand that "small nations must not be allowed to interfere with the development of

great nations, least of all with that of the greatest of nations," and that Holland, simply on the ground of her small size, should be robbed of her three estuaries in the interest of Germany. But neither has one an atom of sympathy with the Dutch habit of taking advantage of that small size to behave in a mean and unreasonable way on the assumption that no Power except Germany would use force against such a little people. I would like to illustrate the position by an analysis of the problem on a canal, for one must include straits and canals with rivers. Their inclusion may involve some difficulty, but in the most serious case the difficulty is already largely solved. I refer to the Panama Canal during the second year of the war, when British shipping was exactly half as large again as U.S.A. shipping, amounting to very nearly 42 per cent. of the whole traffic. The total result of the war, however, has been a loss of more than 5,200,000 tons of British shipping, involving a reduction of 13·5 per cent. in our carrying power at sea, while the U.S.A. tonnage has increased by nearly 6,730,000 tons, *i.e.* an increase of 382·1 per cent. in the U.S.A. sea-going tonnage (June, 1919).

The case which I propose to analyse is that of the Terneuzen Canal, and I wish to press it with all possible emphasis, because it shows a typical case of quite natural—and, therefore, almost pardonable—human selfishness, and its supporters are guilty of an extraordinary blindness to their own mercantile *advantage*.

Ghent is the second port in Belgium and the first industrial town in Flanders. In the days before the separation of the two countries it was connected with Terneuzen, *i.e.* "open-sea" navigation on the Scheldt, by a canal twenty miles long, of which rather more than half was in "Belgian" and rather less than half in "Dutch" territory, the actual sea connection being, unfortunately, in the Dutch territory.

At the time of the Franco-Prussian War the Belgians decided to enlarge the canal, but had to *waste eight years* in obtaining the consent of the Dutch to the undertaking. Even then the consent was given only on the condition that the Belgians should pay for all work done by the Dutch, give an annual grant of some 13,000*l.* for the upkeep of the new works, and grant Terneuzen reduction of rates on Belgian railways! Some twenty-five years later it became necessary again to enlarge the canal; this was begun in 1895 on condition that Belgium again paid all the cost, that the Dutch had the right to close the locks "whenever they deemed it useful to safeguard Dutch interests," and that various other concessions were granted, *e.g.* about the Antwerp-Rozendaal railway; and the complete agreement was signed in 1902. The total cost was 1,600,000*l.*, a large proportion being spent *on the canal port at Terneuzen*; but the control is entirely in the hands of the Dutch; the Belgian part of the canal is both broader and deeper than the Dutch part, and the larger Belgian boats even now cannot reach Terneuzen! That is to say, after all the cost, the concessions, the delay, etc., the trade of Ghent is still hampered and may be cut off at any moment. Of course, the stupidity of the Dutch in thus crippling their own trade is unpardonable; but what about Belgium? Even then her boats have only reached the Scheldt—a river of little use to Holland, but vital to Belgium.

The case is important, because the two nations have lived together in peace in spite of the serious "international servitude" of Belgium, and because practically everything that Holland has done has been quite legal. Dutch officials claim that "Belgium has enjoyed absolute freedom of navigation"; that "Belgium has in no way been made to feel that she had to use the waterway of a neighbour to get access to the sea"; and that "Holland has been perfectly right in asking Belgium to pay for improvements on a canal which admittedly (!) serves almost exclusively Belgian interests." To a Belgian this is mere mockery. And I submit that, if Belgium has to pay almost the entire cost, she ought to have also almost the entire control; that the traffic is very profitable, the tonnage of Terneuzen being relatively larger than that of any other Dutch town, even Rotterdam; that part of the cost has been due to the canal having formed part of the Dutch polder system; and that, under international control, the total cost would have been met out of the profits on the traffic.

Further, I submit that, although the waterway was originally not artificial at all, but a distributary of the Lys, navigation has *not* been free for Belgium. Facilities have been both denied and delayed. Denials have been rare; but the Dutch refused, in 1907, to forgo customs formalities on cargoes moving only and directly between Ghent and Antwerp, and they have refused to provide fog-signals or beacons at Terneuzen. Preposterous delays have been more or less normal. For instance, the request about the customs was made in January, 1906, and was refused in January, 1907; a request for permission to dredge a sandbank, made on November 11, was granted on the following September 17; and another made on July 9 was granted on December 2.

Even the dimensions on the Dutch part of the canal have prevented any real freedom of navigation. These dimensions were originally agreed upon by a mixed body of experts, and accepted almost verbatim by the Dutch Government in 1895. They were modified in 1902, though the 1902 Convention was not ratified; and, thus modified, the scheme of 1895 was completed in 1910. Now, under international control, it would have been completed much sooner; all unnecessary formalities due to riparian sovereignty would have been avoided; all necessary safety would have been immediately provided for, *e.g.* by dredging or fog-signals; and all improvements would have been adopted on their merits. In the absence of international control Belgium has been subject, as I have indicated, to serious "international servitude," which has involved her in heavy costs and continual annoyances. Yet Holland has, practically from first to last, acted with perfect legality. (I intentionally exclude the undoubted illegality of the closing of the Scheldt in August, 1914, the transport of excessive quantities of sand and gravel for German use during the war, and the free passage through Limburg granted to the retreating German armies.) But if the other things referred to are legal, it is high time that they were made illegal.

It has been typical, too, that when the Dutch have granted any facilities, it has been done by a specific treaty, *i.e.* done as a matter of policy, not of justice. It was from this point of view that they agreed to the Lek and the Waal being recognised as the proper mouths of the Rhine. This emphasis on policy rather than on justice has not, however, been confined to Holland, though she alone still adheres to it. In Europe, in America, in Africa, and even in Asia, there have been, first, attempts to enforce a so-called political right of sovereignty against neighbours, *e.g.* on the Mississippi by Spain, on the St. Lawrence by us, on the Amazon by Brazil, on the Zambezi by Portugal, and then special conventions somewhat on the lines of a treaty of commerce. Such treaties grant commercial facilities, and power of navigation is such a facility; but if the navigation is on a great continental feature, such as an international river, surely

the particular facility should be admitted *without* any special treaty.

This claim has been specifically put forward on several occasions. For instance, by the Treaty of Paris (1763) we had the privilege granted to us of "navigation on the Mississippi to the sea," and "*to* the sea" meant "*out onto* the sea." When the river passed under the control of the United States, the conditions were altered. Spain had granted no such facility to them, and she claimed the *political* right to block the estuary against them, while Jefferson claimed that they had a *natural* right to use the whole river, *i.e.* had such a "right in equity, in reason, in humanity." The same question arose on the St. Lawrence, where we claimed the political right to block the lower river against the United States in 1824. The case is specially important because Adams at once admitted the *political* right, *i.e.* the riparian "sovereignty," but claimed—as Jefferson had done—a *natural* right to use the river itself, a right which he based on necessity and on the support of the political Powers of Europe as formulated in many conventions and agreements and commercial treaties.

There had been so many of these that it had become possible to generalise as to a common principle—really the principle of justice; and so the Treaty of Paris in 1814 and the Congress of Vienna had adopted the principle, and had passed general rules in sympathy with it—rules which have been applied to many rivers and even to canals, *e.g.* in the old Kingdom of Poland. In the particular case of the St. Lawrence the water right would not cover any right of portage; but, of course, the international boundary comes to this river from New York State below the last of the rapids.

In 1851 Brazil claimed the political right to block the mouth of the Amazon, but this was universally condemned as a gross misuse of the right of riparian sovereignty, for the mouth of the Amazon is so truly an arm of the sea that it separates two distinct faunas; and, as the Plate was declared free in 1852, Brazil could not in decency exercise her dubious "right." It was not formally given up, however, until 1867; and it lies implicity behind the recent so-called "concessions" to Bolivia.

Portuguese law raised a similar difficulty in 1883 on the Zambezi. Of course, Portugal was our oldest ally, and our relations were very friendly; but, though she neither controlled nor traded with the interior, she claimed the political right to block the estuary against us, and we admitted the *political* right so far as to consent to her imposing duties—which, in theory, might have been prohibitive of all trade.

The Zambezi is specially interesting because it was concerned with one of the first of those land-corridors about which there has been so much discussion lately—the "Caprivi finger." Everyone except our lawyer-politicians knew the real object, the certain meaning, and the probable result of our conceding that strip to Germany—though most of us pictured German troops marching eastward along it to cut the "Cape-to-Cairo" route in Rhodesia, rather than Rhodesians riding westward into Ovamboland. But theoretically the Germans made a demand for access to navigable water on an international river, and we recognised this as a reasonable demand, and granted it. Here, again, we stand historically in a position of great moral strength. Further, if we accept international land-corridors and international air-corridors, we must accept also international water-corridors, such as a navigable river or a narrow strait.

I do not want, however, to press an African example, partly because I do want to repudiate entirely the application of the Berlin Conference to any rivers outside Africa. For in 1884 Africa was essentially a virgin continent, and its inhabitants were completely ignored—in theory by all the deliberators, and in practice also by the nation which had engineered the conference. For one of Germany's essential objects was to converge on the Congo, and squeeze out Belgian interests; and eventually, to do that, she did not hesitate to employ the most unscrupulous propagandists in this country on "Congo atrocities." It was, therefore, part of her scheme to press—what was accepted by the conference—that the Congo should be open to all flags for all commercial purposes, and that *no riparian rights* should be recognised. It was equally to her interest that the International Committee of Administration agreed upon should never be set up, and it never has been; and, of course, in 1911 she used the trouble which she had provoked in Morocco to acquire 100,000 square miles of the French Congo, so that she became a territorial Power in the west as well as in the east of the Congo basin.

The whole question has two aspects—(1) the freedom of the actual navigation, and (2) the administration of the river. The former is largely a matter of equity, and so did not appeal to the Dutch or Portuguese lawyers; the latter is largely a matter of law, and has been much complicated by legal subtleties. But the two are closely connected, for the European rivers with which we are specially concerned, all have a lower course over the plain and an upper course involved in the folds and blocks of Central Europe. They are, therefore, important in the one case merely as carriers by water, and—all things considered, and in spite of superstitions to the contrary—are probably dearer as well as less flexible than the carriers by rail that cross them from west to east; thus the quantity of foodstuffs that reached Berlin—or New Orleans—by water in 1913 was quite insignificant. In the other case, however, they are of supreme importance, for their valleys focus the whole commercial movement, *e.g.* of Switzerland, both by rail and by water. This puts the people of the upper river-basin commercially at the mercy of the holders of the lower; at least a third of the Swiss imports before the war were from Germany, and a fifth of the exports went to Germany—much, in each case, under what the Swiss felt as "compulsion."

In this particular case the people of the Rhine delta were also—politically—at the mercy of the Germans. For the natural outlets of the Rhine basin, such as Rotterdam and Antwerp, had taken on naturally the international character of all great ports, while the river-towns behind them, such as Cologne and Frankfort, were nurseries of intense national feeling, most carefully and criminally fostered by the Government with the declared object of presently imposing that "nationality" upon the "internationalised" port. One way of entirely undermining a position offering such opportunities to the unscrupulous is international control, with its impartial improvement of the waterway *on its own merits*. Thus in 1913 nothing like 1 per cent. of the navigation on the Rhine was British, while more than 65 per cent. was Dutch; but the deepening of the Rhine up to Basel to admit sea-going vessels, *e.g.* from London or Newcastle, would instantly free the Swiss from their slavish dependence on *e.g.* Westphalian coal.

It is the political aspect, however, rather than the economic that I want to press for the moment. The economic aspect is useful only because it can be presented more easily in a statistical form, while the historic—though equally, if not more, illuminating—cannot be applied to recent events. We can see now that Peter the Great did not provide "a gate by which [his] people could get out to the Baltic," only one

by which foreigners got into Russia; but we cannot have similar knowledge of the political value to Bohemia of the economically invaluable Elbe-Moldau. We can note, however, that it is essentially a way *out*, for the quantity of down-stream traffic (*e.g.* lignite, sugar, grain) is five times that of the up-stream traffic (*e.g.* iron, cotton, oils).

The agreements already mentioned, with regard to Elbe and Weser, Tagus and Douro, show that freedom of navigation has been granted as a reasonable courtesy for many years by nearly all civilised Powers, though even to this day Holland has persistently blocked progress by her stupid commercial policy and her unique position at the mouths of Rhine and Maas and Scheldt; and the essential principles are illustrated by the irrigation laws of Australia and the United States, where everyone now admits that the individual State cannot have any local standing, any riparian claims, as against the Commonwealth. All States, whatever their size or wealth or population, must be equal, though the natural advantages are with the upper riparians for irrigation as with the lower riparians for navigation.

The serious administrative difficulties are two—concerned respectively with the riparian sovereignty and with the different geographical conditions of different rivers or different parts of the same river; *e.g.* you can easily decrease the pace of the Rhine above Mannheim, but not without increasing the susceptibility to frost.

Historically, riparian sovereignty, in the case of Rhine and Danube, is only a relic of feudal robbery. When they first became part of the civilised world under Rome, there was no such thing as riparian sovereignty. They were public property, which had to be kept in order and improved; and for this purpose the Romans exacted dues, which were spent wholly and solely on the upkeep of the waterway. The Franks continued the same custom on the Rhine, but the feudal system brought in a horde of petty princelings—as impecunious as German princelings have normally been—who completely upset the old *régime*, converted public into private property, and exacted every kind of tax and toll. Unfortunately, because Rhine and Danube had been frontiers for Rome, they had been associated with a strictly military control, and the legacy of this favoured the feudal princelings—as it also helped to poison the whole political development along both rivers, for they got only the worst side of Roman civilisation. Now we must go back to the primitive conditions. If an international river is a world feature, then its world relation is the first consideration. In that case riparians must tolerate representatives of the whole world, or of such parts of the world as are most concerned with the particular river, on the executive for the administration of the river. In most cases, moreover, riparian sovereignty must be limited, even in the interests of the riparians themselves, for the presence of non-riparians on the executive may be, and has been on the Danube, of the greatest value in minimising friction amongst the riparians. In this respect France has played a most honourable part, generally supported by Britain, especially on the Danube, where, *e.g.* Austria tried to exclude Bavaria from the deliberations about the river, and to dominate and intimidate the representatives of the lower riparians. Indeed, it was only "the day before yesterday" that we had the gratification of reading the German decision to "exclude French and British representatives from the Danube Commission on the ground that they had hindered the ships of the more important nations from obtaining *priority* of treatment." What greater compliment could have been paid to us?

The fact only emphasises the vital point referred to above, that different parts of the same river have different conditions and may need different treatment, *i.e.* that even riparians have not all naturally equal use of the river, and that the strongest or the most favourably situated can grossly misuse their opportunities. The Dutch showed this on the Rhine in 1816, and the Austrians on the Danube in 1856. Obviously such differences are, in themselves, potential causes of serious trouble; riparians have not necessarily and naturally real equality even when the executive consists of only one representative from each riparian State. The greater opportunities of expansion, political and economic, on the lower river may favour the growth of a stronger Power; and the State with the largest share of the river or the best position on it has already an advantage over the others. For instance, the Dutch on the Maas and the Russians on the Danube have indulged in "voluntary negligence"; it was in this way that Russia blocked the mouth of the Danube, and that Holland made it impossible for the Belgians to *continue* their commercial navigation on the Meuse down through Holland to the sea, though since the discovery of coal in Limburg the Belgians have—stupidly—turned the tables on Holland to some extent. A low riparian may no more monopolise or ruin navigation on the lower course of a river than a high riparian may poison or exhaust its upper waters. The river is a unit, and its unity is essential to the fulfilling of its duties in the evolution of world commerce; and, therefore, it needs a unity of administration. This is best secured by a commission of riparians and non-riparians, and such conditions facilitate the use of a river as a political boundary.

Nearly all the important details involved in the internationalising of navigable rivers have been illustrated already in the history of Rhine and Danube, and in both cases France has been an admirable guide to Europe. On the Rhine, as I have mentioned, she abolished in 1795 most of the restrictions which had made the river practically useless even to riparians; and that she was not thinking only of her own interests was proved by her attempt—defeated by Holland—to extend the freedom of the river to all nations in 1797. Again, in the Convention of Paris (1804) France enforced unity of administration—sharing this with Germany on the ground that the river was of special concern to herself and to Germany, as she has shared the administration of the Niger with us in recent years on the same ground.

The Rhine thus received a simple, just, uniform administration, which is a model for us now. All tolls were abolished except two—one on the boat and the other on the cargo—which were to be only large enough to meet the upkeep of the waterway, and were to be used for no other purposes. These tolls could be paid in each political area with the coin of that area, but a fixed ratio was maintained between the various coinages.

Of course, in 1815 France was ousted from the bank of the river; and in the reorganisation elaborated by the Congress of Vienna von Humboldt, the Prussian representative, adroitly introduced into the regulations for the Central Commission of Riparian Representatives words which were afterwards made to mean exactly the opposite of the freedom enforced by France, and exactly the opposite of what our British diplomats at the time thought and said that they meant! Not only so, but during the sixteen long years while France remained more or less submerged, Holland was allowed to make the whole scheme ridiculous by the claim that "to the sea" did not mean "out onto the sea," and that a tidal estuary was

"sea." The Regulations of Mainz gave each riparian State full sovereignty over its own part of the river, and limited the right of pilotage to the subjects of riparian States; and in 1868 the Regulations of Mannheim further whittled down the old liberal principles of France—to the disadvantage of non-riparians, although they were admitted to rights of navigation. The revised Rhine Navigation Treaty of that year was still in force in 1913, administered by the six riparian States—Holland, Prussia, Hesse, Baden, Bavaria, and Germany (as owning Alsace). Even since 1871 Prussia, as the strongest Power, has hampered the development of non-Prussian ports, using even the most childish tricks with pontoon bridges, choice of wharves, accessibility to rail, etc., against other German States.

Since 1871, too, the Rhine has illustrated another important point—namely, that the traffic on an inland waterway depends largely, perhaps vitally, on the extent to which railways are willing or forced to co-operate; and this has a present importance even from a purely international point of view. One of the results of the Franco-Prussian War was that Prussia bought up a number of private railways in the Rhine valley, and eventually used the profits of the transaction to make a secret fund for aggressive purposes. Now, if properly administered as an international waterway, the Rhine will be perfectly free except for trifling dues on boat or cargo for the expenses of upkeep; and it will compete so favourably with the Prussian railways that their rates will have to be reduced to a minimum. This will cut hard at such differential treatment as has handicapped British trade in the last twenty years, and it will leave no surplus with which the unscrupulous can juggle.

Of course, the Rhine is essentially linked with the Meuse and the Scheldt—politically, economically, historically; and the Powers have long been too lenient or too timid with Holland, possibly because her purely *legal* position appeals to lawyer politicians. The Dutch base their claims to monopolise the estuary of the Scheldt on the Treaty of Munster (1648), but have greatly strengthened their legal position in recent years. The marriage of the Dutch Queen to a German princelet was followed immediately by the intrigue that ended in Belgium definitely granting to Holland in 1892 special rights on the Scheldt in time of war, and Germany strongly supported Holland in getting these rights extended between 1905 and 1908. But the Scheldt is merely an international river; it is navigable into France, and it was only by France waiving her claims in 1839, and proposing a dual control by Belgium and Holland—like that of the Rhine by France and Germany at the beginning of last century, and that of the Niger by France and ourselves now—that Holland ever obtained the power which she has abused. When Napoleon annexed Antwerp, he declared the Scheldt free; and the Rhine Regulations, when extended to the Scheldt, were interpreted as meaning "free for all flags out onto the sea." Even so, the Dutch raised every possible difficulty, and navigation had no fair chance until the railway from Cologne to Antwerp brought in the only kind of influence which the Dutch seem to understand.

We have, therefore, full knowledge of all the essential conditions necessary to ensure the proper administration of international rivers, and shall have no kind of excuse if we are caught napping or misled by plausible and "interested" tricksters. Amongst their last tricks is "the great difficulty of policing such a river, where a German boat may be stopped by a French official." That is not more terrible than a Rumanian boat being stopped by an Austrian official; and the experience on the Danube shows that there is really no difficulty at all—for the simple reason that offenders are always dealt with, naturally and reasonably, by officials of their own nation, just as the various European Powers have the right of jurisdiction over their own subjects in the Belgian Congo. In Article 25 the effete and pharisaical Berlin Act of 1884–85 provided that its regulations for the Congo "shall remain in force in time of war." To-day we are less ambitious, and desire only to further safe, easy, honourable intercourse, in time of peace, between nations that are unequal in size and population, wealth and power, situation and relation to navigation facilities. We have seen that one small nation may ill-treat another small nation from stupidity almost as easily and as grossly as a large nation may ill-treat a small nation from tyranny. In the circumstances it seems necessary to remove from both the stupid and the tyrannical the opportunities for misusing such facilities; and the obvious way of doing this is to make international rivers international in use and in government. Commerce is already a prime factor in the evolution of human brotherhood. Progress towards that ideal may be gauged as well by the price of a banana or a piece of chocolate as by the number of sermons preached on the subject; the sea is already free, made so mainly by British perseverance in clearing it of pirates; it only remains to make navigable rivers equally free, and the opposition comes mainly from those who have talked most loudly about "the freedom of the seas." But "the freedom of the seas" does not means that war is to be removed only from that element on which land-power is weak, while the land-power may still block access to the free sea by the natural avenue—the navigable river.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—On October 10 Mr. A. J. Balfour was duly elected to the office of Chancellor of the University in succession to the late Lord Rayleigh.

DR. ROBERT J. T. BELL, of the University of Glasgow, has been appointed to the chair of pure and applied mathematics in the University of Otago.

THE National Union of Scientific Workers is holding a social evening at 52 St. Martin's Lane, W.C.2, on Thursday, October 30, at 7.30, to inaugurate a London branch of the Union. The meeting will be open to all scientific workers.

THE Lord Strathcona legacy to Yale University, which amounts to about 120,000*l.*, will, *Science* announces, be used as follows: Two professorships in the graduate school will be established, and several fellowships founded, and a memorial building, costing about 50,000*l.*, will be built.

DALHOUSIE UNIVERSITY, Halifax, Nova Scotia, celebrated the centenary of its foundation (1818) on September 11, 12, and 13. Representatives were present from a large number of universities and learned bodies. On September 11, in the Macdonald Memorial Library Hall, President A. S. MacKenzie conferred the degree of LL.D. *honoris causa* on the following gentlemen, those marked with an asterisk being *in absentia*:—David Allison, ex-President of the University of Mount Allison; R. B. Bennett, Calgary; the Right Hon. Sir Robert L. Borden, Prime Minister of Canada*; the Hon. W. J. Bowser, Victoria, B.C., ex-Premier of British Columbia*; G. S. Campbell, Halifax, chairman of the Board of Governors, Dalhousie University; C. H. Cahan, Montreal; T. Cant-

ley, New Glasgow; Dr. M. Chisholm, Halifax; the Hon. Robert E. Harris, Chief Justice of Nova Scotia; H. P. Judson, President of the University of Chicago; the Most Rev. Neil MacNeill, Archbishop of Ontario, Toronto*; I. Pitblado, Winnipeg; the Right Rev. John Pringle, Sydney, Moderator of the General Assembly of the Presbyterian Church in Canada; H. S. Pritchett, President of the Carnegie Corporation of New York*; Prof. W. T. Raymond, University of New Brunswick, Fredericton; S. N. Robertson, Principal of the Prince of Wales College, Charlottetown, P.E.I.; J. Gould Schurman, President of the University of Cornell*; J. Seth, professor of moral philosophy in the University of Edinburgh; F. H. Sexton, Principal of the Nova Scotia Technical College, Halifax; the Rev. Prof. Simeon Spidle, Acadia University, Wolfville; J. Stewart, Halifax; the Rev. Prof. J. J. Tompkins, St. Francis Xavier College, Antigonish; and Dr. F. Woodbury, dean of the faculty of dentistry, Dalhousie University, Halifax. The celebration was a great success in many ways; it was made the occasion of a reunion of old graduates dating back to classes as remote as 1852. Besides a procession of representatives of as many of the classes as could be got together, there were a dinner, a dance, a smoking concert, a regatta, and amateur theatricals. Addresses on the future of the University were given as follows:—On arts and science, by Prof. H. L. Stewart (philosophy); on law, by Prof. MacRae, dean of the faculty of law; on medicine, by Prof. Fraser Harris (physiology), dean of the faculty of medicine; and on dentistry, by Dr. Frank Woodbury, dean of the faculty of dentistry. The urgent need of increased endowments, and, especially in the professional schools, of increased equipment as well, was urged by the speakers. There is a large increase in the number of those entering for the coming session, but the University revenues are as in pre-war days.

THE second annual Streatfeild memorial lecture was delivered by Prof. G. T. Morgan at the Technical College, Finsbury, on October 2. In the course of his remarks on "Applied Chemistry in Relation to University Training," Prof. Morgan surveyed the progress of technical education in London from the pioneer college at Finsbury, through the polytechnic movement, to such recent developments as the Imperial College of Science and Technology and the Salters' Institute of Industrial Chemistry. The view which advocates the concentration of instruction and research in applied science into a single large institute, having the status of a specialised university with power to grant degrees in technology, was contrasted with that whereby the technical colleges are to be brought into closer union with the existing University of London. Prof. Morgan pointed out that fundamentally and so far as college training is concerned there is no distinction between pure and applied chemistry. The great generalisations of chemical science must, in any case, be mastered before the student can hope to become competent to enlarge the field of knowledge. Ultimately the difference between university and technical college becomes one of breadth of outlook. In extending the research section of the chemical department at Finsbury, the City and Guilds of London Institute had, during the difficult period of the war, done much to render practicable Streatfeild's ideal of a school of applied chemistry. This objective was an intimate blending of practical elementary training for beginners with specialised investigation in various branches of industrial chemistry carried out by research chemists and other post-graduate workers sent to the college by interested chemical firms. At the present time when considerations of economy are paramount, this mode of developing a technical college of university rank has the merit of involving the least outlay of capital on the part of the educational body, inasmuch as the cost is borne to a considerable extent by those benefiting from the additional facilities.

SOCIETIES AND ACADEMIES.

SYDNEY.

Linnean Society of New South Wales, July 30.—Mr. J. J. Fletcher, president, in the chair.—Dr. R. J. **Tillyard**: Mesozoic insects of Queensland. No. 6: Blattoidea. The paper deals with eleven specimens from the Ipswich Trias, of which nine are named, being placed in three new genera belonging to the family Mesoblattinidæ, Handl. This family occurs from the Carboniferous onwards to the Jurassic, but reaches its dominant position in the Lias. One of the Ipswich genera, Triassoblatta, n.g., is more archaic than any of the known Liassic genera; while a second, Samaroblatta, n.g., shows close affinity with Mesoblattula, Handl., from the Lias of Dobbertin. The author deals with the venation of the cockroach tegmen, and shows the main lines of its evolution from the Carboniferous onwards. The Ipswich specimens, though none of them are absolutely complete, are, on the whole, very well preserved, so that details like intercalated veins, cross-venation, etc., can be easily made out if present. Most of the tegmina are of moderate size, about 13 mm. or 14 mm. long; but there is one species of Triassoblatta that is much larger. Keys are given for distinguishing the genera and species described, and each new species is figured in the text.—Dr. R. J. **Tillyard**: Studies in Australian Neuroptera. No. 8. Revision of the family Ithonidæ, with descriptions of a new genus and two new species. The members of this family are stout-bodied, moth-like Lacewings, very distinct in their appearance, habits, and life-history from any other representatives of the order. Owing to the inadequacy of Newman's original description of *Ithone fusca*, much confusion has been caused, and two species that were not really even congeneric have been regarded as this species. The doubt as to which was Newman's species had to be cleared up by reference to the type in the British Museum. It was then found that Ithone, Newm., with one radial sector in forewing, is a monotypic genus, all the other species going either into Varnia, Walker, which McLachlan erroneously suppressed, or Heterithone, n.g. (type *Ithone fulva*, Till.). Two new species of this latter genus are described, making in all a total of six species for the family. The genus Nespra, Navás, is suppressed, being the same as Varnia, Walker. A description of the peculiar sand-plough of the female Ithonidæ is given; the insect uses it to plough up the sand when ovipositing. A note is added describing the imaginal mouth-parts, and comparing them with those of the Psychopsidæ. The full life-history of Ithone, which is very remarkable, the larva being a blind melolonthoid grub, is reserved for another paper.—Dr. A. J. **Turner**: Revision of Australian Lepidoptera. Part vi. (last instalment). In this paper fifty-nine species belonging to twenty-six genera (fam. Geometridæ, subfam. Boarmianæ) are dealt with, eighteen species and five genera being described as new.

Royal Society of New South Wales, August 6.—Prof. C. E. Fawsitt, president, in the chair.—G. J. **Burrows**: Volume changes in the process of solution.

The paper contains figures showing the change in volume which takes place when two liquids are mixed or when a solid is dissolved in a liquid. These results are discussed, and also the change in volume which results from the solution of a solid in a mixture of two liquids. A much smaller contraction is observed when a solid is dissolved in a mixture of water and alcohol than when it is dissolved in either of the liquids separately.—G. M. **Bennett** and E. E. **Turner**: Note on organo-metallic derivatives of chromium, tungsten, and iron. Organic compounds containing iron in direct union with carbon play an important *rôle* in animal and plant chemistry, and have an interesting future in connection with pharmacology. An attempt has been made to prepare such compounds, and a few preliminary experiments have been carried out also on similar compounds of chromium and tungsten.

CAPE TOWN.

Royal Society of South Africa, August 20.—Dr. J. D. F. Gilchrist, president, in the chair.—Sir Thomas **Muir**: Note on a sum of products which involves symmetrically the *n*th roots of 1.—C. v. **Bonde**: Note on some abnormalities in the Cape crawfish (*Jasus lalandii*). An account was given of some peculiarities observed among specimens procured for laboratory use in the Zoological Department of the University of Cape Town.

BOOKS RECEIVED.

A Laboratory Manual for Elementary Zoölogy. By Dr. L. H. Hyman. Pp. xvi+149. (Chicago, Ill.: The University of Chicago Press; Cambridge: University Press, 1919.) 1.50 dollars.

A Field and Laboratory Guide in Biological Nature-Study. By Prof. Elliot R. Downing. (The University of Chicago Nature-Study Series.) Pp. 120. (Chicago, Ill.: The University of Chicago Press; Cambridge: University Press, 1918.) 1 dollar.

The Hydrogenation of Oils: Catalyzers and Catalysis and the Generation of Hydrogen and Oxygen. By Carleton Ellis. Second edition, thoroughly revised and enlarged. Pp. xvii+767. (London: Constable and Co., Ltd., 1919.) 36*s*. net.

The Manufacture of Chemicals by Electrolysis. By Arthur J. Hale. (A Treatise of Electro-Chemistry.) Pp. xi+80. (London: Constable and Co., Ltd., 1919.) 6*s*. net.

Insect Pests and Plant Diseases in the Vegetable and Fruit Garden. By F. Martin Duncan. Pp. 95+xii plates. (London: Constable and Co., Ltd., 1919.) 3*s*. 6*d*. net.

The Teaching of Science in the Elementary School. By Gilbert H. Trafton. (Riverside Text-books in Education.) Pp. x+293. (New York: Houghton Mifflin Co.; London: Constable and Co., Ltd., 1919.) 6*s*. 6*d*. net.

Problems of Cosmogony and Stellar Dynamics. By J. H. Jeans. Pp. viii+293+plates v. (Cambridge: At the University Press.) 21*s*. net.

Petrology for Students. By Dr. A. Harker. Fifth edition. Pp. viii+300. (Cambridge: At the University Press.) 8*s*. 6*d*. net.

The Nature of Enzyme Action. By Prof. W. M. Bayliss. Fourth edition. Pp. viii+190. (London: Longmans and Co.) 7*s*. 6*d*. net.

Kingston-upon-Hull Before, During, and After the Great War. By T. Sheppard. Pp. 120. (London and Hull: A. Brown and Sons, Ltd.)

The Condensed Chemical Dictionary. Compiled and edited by the Editorial Staff of the Chemical Engineering Catalogue. Pp. 525. (New York: The Chemical Catalogue Co., Inc.) 5 dollars.

Annuaire de l'Observatoire Royal de Belgique, 1920. Pp. vi+353. (Bruxelles: Hayez.)

Hidden Treasure: The Story of a Chore Boy who Made the Old Farm Pay. By J. T. Simpson. Pp. 303. (Philadelphia and London: J. B. Lippincott Co.) 6*s*. net.

Applied Economic Botany Based upon Actual Agricultural and Gardening Projects. By Dr. M. T. Cook. Pp. xviii+261. (Philadelphia and London: J. B. Lippincott Co.) 7*s*. 6*d*. net.

The Amoebae Living in Man. By Prof. C. Dobell. Pp. vi+155+plates v. (London: John Bale, Sons, and Danielsson, Ltd.) 7*s*. 6*d*. net.

DIARY OF SOCIETIES.

THURSDAY, OCTOBER 16.

THE INSTITUTION OF MINING AND METALLURGY, at 5.30.—C. M. Harris: Prospecting for Gold and Other Ores in Western Australia.—F. Danvers Power: Coral Island Phosphates in the Making.

OPTICAL SOCIETY, at 7.30.—J. W. French: The Unaided Eye, II.—Chas. W. Gamble: Projection Screens.

TUESDAY, OCTOBER 21.

ZOOLOGICAL SOCIETY, at 5.30.—E. G. Boulenger: Report on Research Experiments on Methods of Rat Destruction at the Zoological Society's Gardens.—Dr. A. Smith Woodward, Prof. F. Wood Jones, Prof. J. P. Hill, Prof. A. Keith, Mr. R. I. Pocock, Prof. G. Elliot Smith, and Others: Discussion on the Zoological Position and Affinities of Tarsius.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 5.30.—Arnold Philip: Some Laboratory Tests on Mineral Oils.

WEDNESDAY, OCTOBER 22.

INSTITUTION OF AUTOMOBILE ENGINEERS, at 8.—Thos. Clarkson: Presidential Address.

FRIDAY, OCTOBER 24.

PHYSICAL SOCIETY, at 5.—Dr. N. W. McLachlan: The Effect of Pressure and Temperature on a Meter for Measuring the Rate of Flow of a Gas.—J. H. Shaxby: A Cheap and Simple Micro-balance.—J. W. T. Walsh: The Resolution of a Curve into a Number of Exponentials.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Dr. E. Hopkinson: Presidential Address.

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